

CLAIMS

1. A tag interrogation system comprising:
at least one base station; and
a plurality of tags, each having an awake mode and a sleeping mode;
- 5 wherein each base station is operative to broadcast messages which are received by the plurality of tags and has a receiving window during which it is operative to receive messages sent by individual tags from among the plurality of tags, and wherein at least some of the messages broadcast by at least some of the base stations include an indication of the time at which a future receiving window is due to open,
10 thereby to allow tags to conserve power by remaining in said sleeping mode until said future receiving window opens.
2. A tag interrogation system comprising:
at least one base station; and
15 a plurality of tags,
wherein each base station has at least two receiving windows during which the base station is operative to receive messages sent by individual tags from among the plurality of tags,
the receiving windows including:
20 a first, fixed assignment, receiving window comprising a plurality of time slots respectively allocated to the plurality of tags; and
a second, random access, receiving window during which the base station is operative to receive communications from any of the plurality of tags.
- 25 3. A wireless tag communication system comprising:
a first plurality of base stations serving a first plurality of overlapping regions respectively; and
a second plurality of tags;
30 wherein the first plurality of base stations have a cycle of operation including:
a first plurality of generally non-overlapping broadcasting windows during which the first plurality of base stations, respectively, broadcast; and

a common receiving window during which substantially all of the first plurality of base stations are operative simultaneously to listen for and receive messages from the second plurality of tags.

- 5 4. An asset monitoring system comprising:
at least one base station; and
a plurality of asset monitoring tags;
wherein the plurality of asset monitoring tags and at least one base
stations have defined between them at least one routine communications receiving
10 window in which at least one base station is operative to receive communications sent
by individual asset monitoring tags from among the plurality of asset monitoring tags;
and wherein the plurality of asset monitoring tags and at least one base
station also have defined between them at least one emergency communications
receiving window in which only those asset monitoring tags which have identified
15 themselves as meeting a predetermined emergency criterion, are eligible to utilize,
whereby said emergency communications receiving window is statistically less crowded
than said routine communications receiving window.

5. An asset monitoring system according to claim 4 wherein the plurality of
20 asset monitoring tags comprises a plurality of asset tracking tags.

6. An asset monitoring system according to claim 4 wherein the plurality of
asset monitoring tags comprises a plurality of security monitoring tags each providing
security within an area of coverage.

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7. A system according to claim 1 wherein each tag comprises a mobile tag.

8. A system according to claim 1 wherein communication between base
units and tags comprises wireless communication.

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9. A tag interrogation system comprising:
at least one base station; and

a plurality of tags;

wherein each base station has a random access receiving window including at least one non-allocated time slot during which the base station is operative to receive a message from an individual tag from among the plurality of tags,

5 and wherein each base station is operative to provide an acknowledge message following receipt of the message from the individual tag, wherein the acknowledge message comprises a dynamic identifier of the individual tag characterizing the current communication status of the individual tag.

10 10. A system according to claim 9 wherein said dynamic identifier characterizing the individual tag's current communication status comprises an identification of the slot within which the individual tag most recently transmitted.

15 11. A system according to claim 9 wherein said dynamic identifier characterizing the individual tag's current communication status comprises a digital signature of the most recent message transmitted by the individual tag.

12. A tag interrogation system comprising:

at least one base station; and

20 a plurality of tags, each having a unique tag identification code, said unique tag identification code including a common portion which is common to a plurality of tags of a predetermined user and a tag specific portion which is unique to each individual tag,

wherein each base station is operative to broadcast messages which are

25 received by the plurality of tags and said plurality of tags are operative to respond to said broadcast messages.

13. A seal interrogation system comprising:

at least one base station; and

30 a plurality of seals, each having a unique seal identification code, said unique seal identification code including a common portion which is common to a plurality of seals of a predetermined user and a seal specific portion which is unique to

each individual seal;

wherein each base station is operative to broadcast messages which are received by the plurality of seals and said plurality of seals are operative to respond to said broadcast messages.

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14. A tag interrogation system comprising:

at least one base station; and

a plurality of tags,

wherein each base station is operative to broadcast messages which are

10 received by the plurality of tags and only ones of plurality of tags which have been tampered with are operative to respond to said broadcast messages.

15. A tag interrogation system comprising:

at least one base station; and

15 once actuated, said tags being selectively actuatable in response to wireless actuation messages,

wherein each base station is operative to broadcast actuation messages which are received by the plurality of tags and are operative to actuate said tags.

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16. A system according to any of claim 1 and wherein at least some of said plurality of tags is operative to transmit an emergency message outside of a receiving window.

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17. A tag interrogation system comprising:

at least one base station; and

a plurality of tags,

wherein each base station is operative to broadcast messages which are received by the plurality of tags, said messages including tracking messages at transmission power levels which monotonically decrease over time and said plurality of tags each respond to the base station indicating which tracking message was received, thereby indicating the level of transmission power which each tag requires in order to

receive the message and thus indicating its distance from a given base station.

18. A system according to claim 2 wherein each tag comprises a mobile tag.
- 5 19. A tag interrogation system comprising:
at least one base station; and
a plurality of tags, which are operative for sensing tampering thereof
once actuated and activated, said tags being selectively actuatable in response to wireless
actuation messages,
- 10 wherein each base station is operative to broadcast actuation messages
which are received by the plurality of tags and are operative to actuate said tags.
- 15 20. A tag interrogation system according to claim 19 and wherein said tag
can only be activated following actuation thereof.
21. A tag interrogation system according to claim 20 and wherein said tag is
activated by a physical action following actuation thereof in response to a wireless
actuation message.
- 20 22. A tag interrogation system according to claim 19 wherein each of said
plurality of tags comprises a memory and wherein each base station is operative to
broadcast at least two types of actuation messages, a first actuation message which
resets said memory and a second actuation message which does not reset said memory.
- 25 23. A tag interrogation system according to claim 19 wherein each of said
plurality of tags comprises a memory and wherein each base station is operative to
broadcast a memory download messages which causes contents of said memory to be
downloaded to said base station.
- 30 24. A tag interrogation system according to claim 19 and wherein
communication between said at least one base station and said plurality of tags is
encrypted.

25. A tag interrogation system according to claim 19 and also comprising an authenticator for authenticating communication between said at least one base station and said plurality of tags.

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26. A system according to claim 3 wherein each tag comprises a mobile tag.

27. A system according to claim 4 wherein each tag comprises a mobile tag.

10 28. A system according to claim 2 wherein communication between base units and tags comprises wireless communication.

29. A system according to claim 3 wherein communication between base units and tags comprises wireless communication.

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30. A system according to claim 4 wherein communication between base units and tags comprises wireless communication.

20 31. A system according to claim 2 and wherein at least some of said plurality of tags is operative to transmit an emergency message outside of a receiving window.

32. A system according to claim 3 and wherein at least some of said plurality of tags is operative to transmit an emergency message outside of a receiving window.

25 33. A system according to claim 4 and wherein at least some of said plurality of tags is operative to transmit an emergency message outside of a receiving window.

34. A system according to claim 9 and wherein at least some of said plurality of tags is operative to transmit an emergency message outside of a receiving window.

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35. A system according to claim 12 and wherein at least some of said plurality of tags is operative to transmit an emergency message outside of a receiving

window.

36. A system according to claim 13 and wherein at least some of said plurality of tags is operative to transmit an emergency message outside of a receiving window.

37. A system according to claim 14 and wherein at least some of said plurality of tags is operative to transmit an emergency message outside of a receiving window.

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38. A system according to claim 15 and wherein at least some of said plurality of tags is operative to transmit an emergency message outside of a receiving window.

15 39. A system according to claim 1 and wherein communication between said at least one base station and said plurality of tags employs synchronization signals based on at least one of the following bit strings:

0, 0, 0, 1, 1, 0, 0, 0

1, 0, 0, 1, 1, 0, 0, 0

20 0, 1, 0, 1, 1, 0, 0, 0

1, 1, 0, 1, 1, 0, 0, 0

0, 0, 0, 1, 1, 1, 1, 0

40. A system according to claim 2 and wherein communication between 25 said at least one base station and said plurality of tags employs synchronization signals based on at least one of the following bit strings:

0, 0, 0, 1, 1, 0, 0, 0

1, 0, 0, 1, 1, 0, 0, 0

30 0, 1, 0, 1, 1, 0, 0, 0

1, 1, 0, 1, 1, 0, 0, 0

0, 0, 0, 1, 1, 1, 1, 0

41. A system according to claim 3 and wherein communication between said at least one base station and said plurality of tags employs synchronization signals based on at least one of the following bit strings:

0, 0, 0, 1, 1, 0, 0, 0

5
1, 0, 0, 1, 1, 0, 0, 0
0, 1, 0, 1, 1, 0, 0, 0
1, 1, 0, 1, 1, 0, 0, 0
0, 0, 0, 1, 1, 1, 1, 0

10 42. A system according to claim 4 and wherein communication between said at least one base station and said plurality of tags employs synchronization signals based on at least one of the following bit strings:

0, 0, 0, 1, 1, 0, 0, 0
1, 0, 0, 1, 1, 0, 0, 0
15 0, 1, 0, 1, 1, 0, 0, 0
1, 1, 0, 1, 1, 0, 0, 0
0, 0, 0, 1, 1, 1, 1, 0

20 43. A system according to claim 9 and wherein communication between said at least one base station and said plurality of tags employs synchronization signals based on at least one of the following bit strings:

0, 0, 0, 1, 1, 0, 0, 0
1, 0, 0, 1, 1, 0, 0, 0
25 0, 1, 0, 1, 1, 0, 0, 0
1, 1, 0, 1, 1, 0, 0, 0
0, 0, 0, 1, 1, 1, 1, 0

30 44. A system according to claim 12 and wherein communication between said at least one base station and said plurality of tags employs synchronization signals based on at least one of the following bit strings:

0, 0, 0, 1, 1, 0, 0, 0
1, 0, 0, 1, 1, 0, 0, 0

0, 1, 0, 1, 1, 0, 0, 0
1, 1, 0, 1, 1, 0, 0, 0
0, 0, 0, 1, 1, 1, 1, 0

5 45. A system according to claim 13 and wherein communication between said at least one base station and said plurality of tags employs synchronization signals based on at least one of the following bit strings:

0, 0, 0, 1, 1, 0, 0, 0
1, 0, 0, 1, 1, 0, 0, 0
10 0, 1, 0, 1, 1, 0, 0, 0
1, 1, 0, 1, 1, 0, 0, 0
0, 0, 0, 1, 1, 1, 1, 0

15 46. A system according to claim 14 and wherein communication between said at least one base station and said plurality of tags employs synchronization signals based on at least one of the following bit strings:

0, 0, 0, 1, 1, 0, 0, 0
1, 0, 0, 1, 1, 0, 0, 0
20 0, 1, 0, 1, 1, 0, 0, 0
1, 1, 0, 1, 1, 0, 0, 0
0, 0, 0, 1, 1, 1, 1, 0

25 47. A system according to claim 15 and wherein communication between said at least one base station and said plurality of tags employs synchronization signals based on at least one of the following bit strings:

0, 0, 0, 1, 1, 0, 0, 0
1, 0, 0, 1, 1, 0, 0, 0
30 0, 1, 0, 1, 1, 0, 0, 0
1, 1, 0, 1, 1, 0, 0, 0
0, 0, 0, 1, 1, 1, 1, 0

48. A system according to claim 17 and wherein communication between

said at least one base station and said plurality of tags employs synchronization signals based on at least one of the following bit strings:

5 0, 0, 0, 1, 1, 0, 0, 0

 1, 0, 0, 1, 1, 0, 0, 0

 0, 1, 0, 1, 1, 0, 0, 0

 1, 1, 0, 1, 1, 0, 0, 0

 0, 0, 0, 1, 1, 1, 1, 0

49. A system according to claim 19 and wherein communication between
10 said at least one base station and said plurality of tags employs synchronization signals
based on at least one of the following bit strings:

15 0, 0, 0, 1, 1, 0, 0, 0

 1, 0, 0, 1, 1, 0, 0, 0

 0, 1, 0, 1, 1, 0, 0, 0

 1, 1, 0, 1, 1, 0, 0, 0

 0, 0, 0, 1, 1, 1, 1, 0